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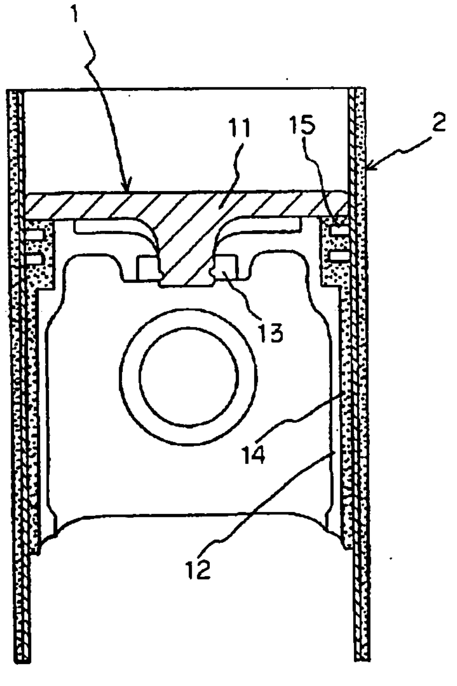
(54)【発明の名称】　２サイクルエンジンのピストン

(57)【要約】
【目的】高負荷運転にてもピストンの焼付が防止でき、耐久性の優れた２サイクルエンジンのピストン構造を提供する。

【構成】多孔質窒化珪素からなるシリンダライナの内面にはポリシラザンを付着させて滑面となし、ピストン１の胴部１２の外壁に多孔質窒化珪素の層１４を形成させてその内側にアルミニウムを含浸させる。またピストンリング溝１５の部分は多孔質窒化珪素とアルミニウムでメタルセラミックスコンポジットを構成させて耐摩耗性を向上させて高負荷時における焼付を防止する。



【特許請求の範囲】

【請求項１】ピストンの胴部の外周部に多孔質の窒化珪素を配置しその内側にアルミニウムを含浸させるとともに、多孔質の窒化珪素からなるピストンリング溝部にアルミニウムを含浸させたピストンと、多孔質の窒化珪素を用いたシリンダライナの内壁面にポリシラザンを付着させてピストンとの摺動面を滑面に形成したシリンダとを備えたことを特徴とする２サイクルエンジンのピストン構造。

【請求項２】前記の多孔質の窒化珪素は窒素雰囲気中にて珪素からなる成型品を反応焼結せしめたものであることを特徴とする請求項１記載の２サイクルエンジンのピストン構造。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は高負荷を要する２サイクルエンジンのピストン構造に関する。

【０００２】

【従来の技術】燃料の燃焼を機関の内部で行い、発生する熱エネルギーによりピストンを往復させて駆動するエンジンでは、ピストンの２行程、すなわちクランク軸１回転にて吸入、圧縮、爆発、排気の過程を行う２サイクルエンジンと、ピストンの４行程、すなわちクランク軸２回転の間に前記の４過程を行う４サイクルエンジンとに大別されている。

【０００３】そして、２サイクルエンジンではクランク軸の１回転毎に爆発が行われるため、出力軸の回転変動が少なく高トルクが発生できるという利点がある。

【０００４】

【発明が解決しようとする課題】一方、このような２サイクルエンジンでは、小さな容量で負荷を大にして大出力を得ようとすると、発熱のためピストンリングの部分の潤滑不良が高じてシリンダとの焼付が生ずるという問題がある。

【０００５】本発明はこのような問題に鑑みてなされたものであり、その目的は高負荷運転に耐えてピストンの焼付が発生し難い２サイクルエンジンのピストン構造を提供しようとするものである。

【０００６】

【課題を解決するための手段】上述の目的を達成するために本発明によれば、ピストンの胴部の外周部に多孔質の窒化珪素を配置しその内側にアルミニウムを含浸させるとともに、多孔質の窒化珪素からなるピストンリング溝部にアルミニウムを含浸させたピストンと、多孔質の窒化珪素を用いたシリンダライナの内壁面にポリシラザンを付着させてピストンとの摺動面を滑面に形成したシリンダとを備えた２サイクルエンジンのピストン構造が提供される。

【０００７】

【作用】多孔質窒化珪素のシリンダライナの内壁面にポリシラザンを付着させて滑面に形成し、ピストンの胴部の外壁面に配置した多孔質窒化珪素の内側にはアルミニウムを含浸させるとともにピストンリング溝の部分は多孔質窒化珪素とアルミニウムにてメタルセラミックスコンポジットを構成させるので、ピストンの往復運動に際して平滑なシリンダライナと多孔質窒化珪素との組合せにより摩擦係数が小になり、さらにピストンリング溝部の耐摩耗性の向上により高負荷運転でも焼付が防止される。

【０００８】

【実施例】つぎに本発明の実施例について図面を用いて詳細に説明する。

【０００９】図１は本発明にかかる２サイクルエンジンのピストン構造の一実施例を示す断面図であり、同図において１はピストンであり、２はそのシリンダライナである。

【００１０】ピストン１の頭部１１は高熱に耐えるとともに高強度の窒化珪素（$Si_3 O_4$）が用いられて、胴部１２とは金属性のリング１３により連結されている。そして、胴部１２の外周壁には反応焼結により作成された多孔質の窒化珪素の層１４が配置され、その内側にはアルミニウム（Ａｌ）が含浸されている。また、ピストンリング溝１５の部分にも多孔質の窒化珪素が使用されアルミニウムが含浸されて、高強度のメタルセラミックスコンポジットが構成されており、優れた耐摩耗性を有している。

【００１１】シリンダライナ２も反応焼結にて作成された多孔質の窒化珪素からなるもので、その内壁面には例えばポリシラザン（例えば$H_2 SiNCH_3$，$[CH_3 SiHNH]n$）を付着させて滑面が形成され、表面密度の向上が図られている。

【００１２】このように構成された本実施例においては、ピストン１の胴部１２の外周壁は多孔質の窒化珪素が配置されてアルミニウムが含浸されており、また多孔質の窒化珪素からなるシリンダライナ２の内壁面はポリシラザンにより密度が向上されて平滑に仕上げられているので、滑面と多孔質の窒化珪素との組合せにより摩擦係数が小になって円滑に摺動することになり、さらにピストンリング溝１５の部分は高強度のメタルセラミックスコンポジットとなっって耐摩耗性が優れているため、シリンダライナ２との焼付の発生が防止されることになる。

【００１３】以上、本発明を上述の実施例によって説明したが、本発明の主旨の範囲内で種々の変形が可能であり、これらの変形を本発明の範囲から排除するものではない。

【００１４】

【発明の効果】上述の実施例のように本発明によれば、ピストンの胴部の外周部とシリンダライナとの反応焼結による多孔質の窒化珪素を用い、ピストンリング溝の部

分にはアルミニウムを含浸させて耐摩耗性を向上させるとともに、シリンダライナの内壁にはポリシラザンを付着させて滑面化を図ったので、平滑なシリンダライナと多孔質窒化珪素との組合せで摩擦係数が小さいため、エンジン負荷を増して熱的に苛酷な運転を行っても焼付が発生することなく、耐久性の優れた２サイクルエンジンが得られる。

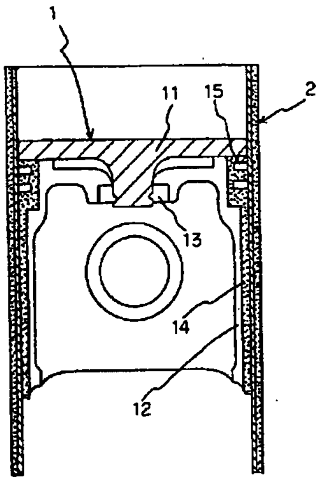
【図面の簡単な説明】

【図１】本発明にかかる２サイクルエンジンのピストン構造の一実施例を示す断面図である。

【符号の説明】

１…ピストン
２…シリンダライナ
１５…ピストンリング溝

【図１】



DERWENT-ACC-NO: 1993-357697

DERWENT-WEEK: 199345

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TITLE: Piston for two=stroke engine having improved
durability
- including porous silicon nitride on external part of
barrel section and aluminium@ on inside and
poly:silazane
on inner part of cylinder

PATENT-ASSIGNEE: ISUZO CERAMICS KENKYUSHO KK[ISUZ]

PRIORITY-DATA: 1992JP-0089423 (March 13, 1992)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 05263932 A	October 12, 1993	N/A	003	F16J 001/01

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
JP 05263932A	N/A	1992JP-0089423	March 13, 1992

INT-CL (IPC): F02F001/00, F02F003/00 , F16J001/01 , F16J010/00

ABSTRACTED-PUB-NO: JP 05263932A

BASIC-ABSTRACT:

The piston for two-cycle engine includes: (a) A piston - Porous silicon nitride is provided on the external periphery of a barrel section. Aluminium is impregnated in its inside. Aluminium is impregnated into a piston ring groove section comprising porous silicon nitride. The piston comprises porous silicon nitride; and (b) a cylinder - polysilazane is stuck on the inner wall of a cylinder liner formed of porous silicon nitride to form a sliding surface to the piston. The porous silicon nitride is formed by applying reaction sintering to a moulding comprising silicon in nitrogen atmos..

The polysilazane comprises: $H_2 SiNCH_3$, $(CHSiHNH)_n$.

USE/ADVANTAGE - The piston is used in the two-cycle engine. A combination of the smooth cylidner liner and the porous silicon nitride reduces coefft. of friction. The result generates no burning even if thermally severe

operation
is done by increasing an engine load. The resulting two-cycle engine features
superior durability.

CHOSEN-DRAWING: Dwg.0/1

TITLE-TERMS: PISTON TWO=STROKE ENGINE IMPROVE DURABLE POROUS SILICON NITRIDE
EXTERNAL PART BARREL SECTION ALUMINIUM@ POLY SILAZANE INNER PART
CYLINDER

DERWENT-CLASS: A26 A88 Q52 Q65

CPI-CODES: A06-A00E2; A12-H10; A12-T04C;

ENHANCED-POLYMER-INDEXING:
Polymer Index [1.1]
017 ; D01 D11 D10 D50 D81 F82 F86 F83 ; P1434 F82
Polymer Index [1.2]
017 ; Q9999 Q9234 Q9212 ; Q9999 Q9289 Q9212 ; Q9999 Q7976 Q7885
; K9676*R ; K9712 K9676 ; B9999 B5367 B5276 ; N9999 N7147 N7034
N7023 ; B9999 B5287 B5276 ; ND01 ; Q9999 Q7603*R ; K9494 K9483

POLYMER-MULTIPUNCH-CODES-AND-KEY-SERIALS:
Key Serials: 0231 1304 2657 2658 2751 2829 3283 3300 3317

Multipunch Codes: 017 04- 05- 229 334 42& 431 52& 57& 597 598
599 623 629 672
723

SECONDARY-ACC-NO:
CPI Secondary Accession Numbers: C1993-158806
Non-CPI Secondary Accession Numbers: N1993-276052

PATENT ABSTRACTS OF JAPAN

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(51)Int.Cl.

F16J 1/01
F02F 1/00
F02F 3/00
F02F 3/00
F16J 10/00

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(21)Application number : 04-089423

(71)Applicant : ISUZU CERAMICS KENKYUSHO:KK

(22)Date of filing : 13.03.1992

(72)Inventor : KAWAMURA HIDEO

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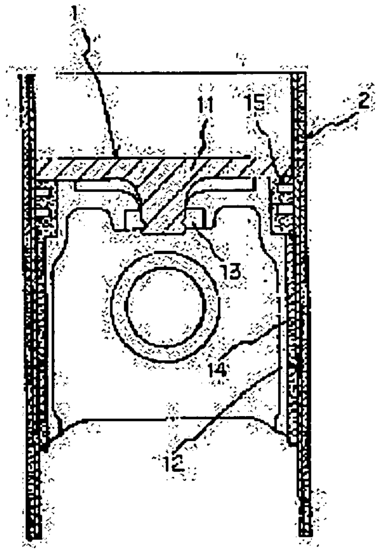
(54) PISTON OF TWO-CYCLE ENGINE

(57)Abstract:

PURPOSE: To provide a piston structure of two-cycle engine that is able to keep off any seizure or binding even in high load driving and, what is more, excellent in durability.

CONSTITUTION: Polysilazane is put on the inner surface of a cylinder liner 2 consisting of porous silicon nitride, making it into a smooth surface, while a layer 14 of the porous silicon nitride is formed on an outer wall of a drum part 12 of a piston and then aluminum is impregnated at the inner side. In addition, a portion of a piston ring groove 15 is composed of a metal ceramics composite with the porous silicon nitride and aluminum in combination, through which it is improved in terms of wear resistance and any seizure or binding at the time of high load driving is thus prevented from occurring.



LEGAL STATUS

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the examiner's decision of rejection or
application converted registration]

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[Patent number]

[Date of registration]

[Number of appeal against examiner's
decision of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] Piston structure of the two-cycle engine characterized by having the piston which infiltrated aluminum into the piston ring slot which consists of porous silicon nitride, and the cylinder which polysilazane was made to adhere to the internal surface of the cylinder liner using porous silicon nitride, and formed the sliding surface with a piston in the glide plane while arranging porous silicon nitride in the periphery section of the drum section of a piston and infiltrating aluminum into the inside.
[Claim 2] The silicon nitride of the aforementioned porosity is the piston structure of the two-cycle engine according to claim 1 characterized by carrying out reaction sintering of the cast which consists of silicon in nitrogen-gas-atmosphere mind.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the piston structure of a two-cycle engine of requiring a heavy load.
[0002]
[Description of the Prior Art] With the engine which burns a fuel, and a piston is made to go and come back to with the heat energy generated inside an engine, and is driven, it is divided roughly into the four stroke cycle engine which performs the four aforementioned processes between crankshaft 2 rotations in the two-cycle engine which performs the process of inhalation, compression, explosion, and exhaust air by about two-line, i.e., crankshaft, 1 rotation of a piston, and about four lines of a piston.
[0003] And with a two-cycle engine, since explosion is performed for every rotation of a crankshaft, there is an advantage that there is little rotation fluctuation of an output shaft and high torque can be generated.
[0004]
[Problem(s) to be Solved by the Invention] On the other hand, with such a two-cycle engine, when a load tends to be made into size by small capacity and it is going to obtain high power, there is a problem that the poor lubrication of the part of the piston ring develops for generation of heat, and printing with a cylinder arises.
[0005] This invention is made in view of such a problem, and the purpose tends to offer the piston structure of the two-cycle engine which is equal to heavy load operation and printing of a piston cannot generate easily.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, while according to this invention arranging porous silicon nitride in the periphery section of the drum section of a piston and infiltrating aluminum into the inside, the piston structure of the two-cycle engine equipped with the piston which infiltrated aluminum into the piston ring slot which consists of porous silicon nitride, and the cylinder which polysilazane was made to adhere to the internal surface of the cylinder liner using porous silicon nitride, and formed the sliding surface with a piston in the glide plane is offered.
[0007]
[Function] While infiltrating aluminum inside the porosity silicon nitride which polysilazane was made to adhere to the internal surface of the cylinder liner of porosity silicon nitride, formed in the glide plane, and has been arranged to the skin of the drum section of a piston, since the part of a piston ring groove makes a metal-ceramics composite constitute from porosity silicon nitride and aluminum, on the occasion of the reciprocating motion of a piston, coefficient of friction becomes smallness with the combination of a smooth cylinder liner and porosity silicon nitride, and printing is further prevented also for heavy load operation by the wear-resistant improvement in a piston ring slot.
[0008]
[Example] Next, a drawing is used about the example of this invention, and it explains to a detail.
[0009] Drawing 1 is the sectional view showing one example of the piston structure of the two-cycle engine concerning this invention, 1 is a piston in this drawing, and 2 is the cylinder liner.
[0010] While bearing high temperature, the silicon nitride (Si_3O_4) of high intensity is used, and the

head 11 of a piston 1 is connected with the ring 13 of metallicity [drum section / 12]. And the layer 14 of the silicon nitride of the porosity created by the peripheral wall of a drum section 12 by reaction sintering is arranged, and aluminum (aluminum) sinks into the inside. Moreover, porous silicon nitride is used also for the part of a piston ring groove 15, aluminum sinks in, the metal-ceramics composite of high intensity is constituted, and it has the outstanding abrasion resistance.

[0011] A cylinder liner 2 also consists of silicon nitride of the porosity created in reaction sintering, polysilazane (for example, H2 SiNCH3, [CH3 SiHNH] n) is made to adhere to the internal surface, a glide plane is formed, and improvement in surface density is achieved.

[0012] Thus, in constituted this example, as for the peripheral wall of the drum section 12 of a piston 1, porous silicon nitride is arranged, and aluminum sinks in. Moreover, since the consistency of the internal surface of the cylinder liner 2 which consists of porous silicon nitride improves by polysilazane and it is finished flat and smooth Since coefficient of friction becomes smallness with the combination of a glide plane and porous silicon nitride, it will slide smoothly and the part of a piston ring groove 15 is further excellent in abrasion resistance in the metal-ceramics composite and **** of high intensity, Generating of printing with a cylinder liner 2 will be prevented.

[0013] As mentioned above, although the above-mentioned example explained this invention, deformation various by within the limits of the main point of this invention is possible, and these deformation is not eliminated from the range of this invention.

[0014]

[Effect of the Invention] While infiltrating aluminum into the part of a piston ring groove and raising abrasion resistance using the silicon nitride of the porosity by reaction sintering of the periphery section of the drum section of a piston, and a cylinder liner like an above-mentioned example according to this invention Since polysilazane was made to adhere to the wall of a cylinder liner and glide plane-ization was attained The two-cycle engine which was excellent in endurance is obtained without printing occurring in the combination of a smooth cylinder liner and porosity silicon nitride, even if it increases an engine load and performs cruel operation thermally since coefficient of friction is small.

[Translation done.]